



PATENT  
Docket No. 491712000100

**CERTIFICATE OF HAND DELIVERY**

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on August 20, 2001.

*Anika Shopshire*  
Anika Shopshire

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Eugene S. SMOTKIN

Serial No.: 09/891,200

Filing Date: June 26, 2001

For: HYDROGEN PERMEABLE  
MEMBRANE FOR USE IN FUEL  
CELLS, AND PARTIAL REFORMATE  
FUEL CELL SYSTEM HAVING  
REFORMING CATALYSTS IN THE  
ANODE FUEL CELL COMPARTMENT

Examiner: To Be Assigned

Group Art Unit: To Be Assigned

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**PETITION TO MAKE SPECIAL UNDER MPEP 708.02 (VI)**

**DECLARATION OF DR. EUGENE S. SMOTKIN**

Commissioner for Patents  
Washington, D.C. 20231

Sir:

Eugene S. Smotkin declares under penalty of perjury under the laws of the United States of America as follows:

1. I reside at 720 S. Dearborn, Unit 606- Chicago, IL 60605. I received a Ph.D. in Chemistry from University of Texas at Austin in 1989. Since 1992, I am a professor at Illinois Institute of Technology (IIT) and have been engaged mainly in research on fuel cells. I

have published **25 peer-reviewed articles**. Starting May 2000, I have been on a leave of absence from IIT and I entered employment with NuVant Systems, Inc., in June 2000. I am very familiar with the art relating to fuel cell technology. I am a named inventor on this patent application.

2. I am filing this Declaration to petition to make special this patent application because this invention materially contributes to the discovery and development of an energy resource, namely, conversion of chemical energy to electrical energy by fuel cell.

3. Having regard to the requirement under MPEP 708.02 (VI), I explain how the invention claimed in this application materially contributes to the discovery and development of an energy resource.

4. The partial reformate fuel cell (PRFC) invention contributes to the discovery and development of an energy resource as a device that enables the efficient conversion of fuels such as methane, alcohols, gasoline, diesel and other hydrocarbon fuels to electricity. The PRFC does not involve internal combustion (IC) of fuel. Thus the energy conversion process does not involve the formation of oxides of nitrogen, which are the main components of "smog". Oxides of nitrogen are formed because the IC of fuels requires air as an oxidant and air is 80% nitrogen. At the high temperatures of internal combustion, the nitrogen is oxidized to  $\text{NO}_x$  where x is 1, 2 or 3. The PRFC involves fuel cell operation at intermediate temperatures ( $250^\circ\text{C} - 450^\circ\text{C}$ ) where CO is not a poison. Fuel cells have never operated in this temperature range because there have not been electrolytes available for this temperature range. This invention teaches an inorganic electrolyte system that is stable in the range of  $250^\circ\text{C} - 450^\circ\text{C}$ . Thus the PRFC is more reliable and not vulnerable to transient high concentrations of CO that are common in conventional reformer outputs. In addition, in cases where the reformer fuel requires high temperatures (e.g.  $800^\circ\text{C}$  to  $1000^\circ\text{C}$ ) for reformation, the temperature differential between the reformer and the fuel cell is less for the PRFC in comparison to polymer electrolyte membrane (PEM) fuel cells that operate at temperatures below  $100^\circ\text{C}$ . Thus the process control required for the PRFC is less complex than for conventional PEM fuel cells because the changes in

temperature required for the process is less for the PRFC system. The PRFC is a revolutionary concept enables the construction of fuel cells that are more reliable and more compact.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed at Chicago, USA, on this 7th day of July 2001.



Eugene S. Smotkin